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IPSATIVE RANKINGS AS AN INDICATOR OF JOB-WORKER MATCH

By

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Brooks Air Force Base, Texas 78235

December 1978
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AIR FORCE SYSTEMS COMMAND
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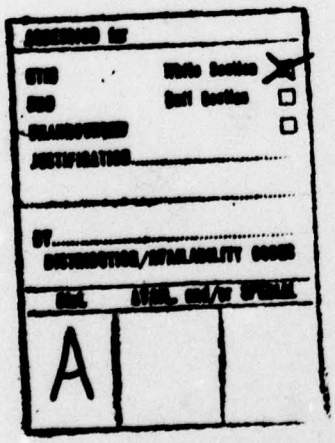

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Ipsative measures of rated characteristics avoid the problems of halo and leniency error, but they have not been useful in discriminating between subjects (normative uses). This study investigated the efficacy of converting ipsative measures of subjects and of jobs to a job-worker match coefficient of correlation, which then might be used normatively. The results did not firmly establish the superiority of either ipsative or normative rankings.

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PREFACE

This research was conducted under task 2313T6, Force Acquisition, Assignment, and Evaluation. The authors would like to express their appreciation to Mr. Henry Clark of the Computational Sciences Division, Air Force Human Resources Laboratory, for the excellent statistical and programming support provided during the course of the study.

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IPSATIVE RANKINGS AS AN INDICATOR OF JOB-WORKER MATCH

I. INTRODUCTION

Ratings have been used as a criterion in so many prediction studies that it is pointless to reference even a typical few. Ratings, in one form or another, are involved in almost every personnel decision, and yet we know that rating scores—particularly those used operationally—are beset by difficulty and error at every turn. One of the most commonly recognized rating errors is that which is called "leniency" error, and it refers to the common observation that different raters have different standards of excellence and that much of the variance in a set of rating scores is due to simple variability of the means of ratings given by various raters. This is the component of the rating score which Cronbach (1955) called "Elevation" and which ". . .reflect his (the rater's) way of using the response scale."

When ratings are given operationally in a setting which requires that the ratings be accessible to the ratee, the ratings typically become inflated so that the rating scores cluster around the maximum score, and variance is sharply diminished. This effect probably occurs because ratings are usually made by supervisors, who are faced with conflicting demands—they are required to evaluate their employees but, for the sake of production, they must be careful not to demotivate their employees with low ratings. Except for the obvious solutions to this dilemma (taking the evaluative duty away from the supervisor or allowing the ratings to be made privately, neither of which is likely to be acceptable), methods for collecting useful rating data in a public rating environment are not numerous.

A way to prevent inflation in ratings is to require the rater to rank-order elements of a list of pertinent characteristics from strongest to weakest as they are observed in the ratee. This procedure will provide a scoring of these characteristics which is ipsative in nature—that is, the profile issuing from this exercise provides information about the ratee only as his characteristics are compared with each other. The scores are not necessarily comparable from one ratee to the next, as are normative[1] scores, because there is no common basis of comparison. The weakest characteristic of Person A can conceivably be better than the best characteristic of Person B, so direct comparisons across ratees of these ipsative rankings are not feasible.

However, rankings of a set of characteristics can be made for both a person and a job (e.g., "How would you rank these characteristics for an ideal incumbent?" or "Now rank these characteristics to show how important they are to successful performance."), and the two rankings can then be compared through a rank-order correlation coefficient. The coefficient produced should reflect a kind of worker-job match, at least in terms of patterns of relative importance of characteristics. A useful quality of this coefficient is that one is produced for each ratee, and it may then be considered as another variable (albeit one with an unusual distribution), comparable across subjects. It should be kept in mind that this coefficient of worker-job match is different from the more typical normative rating score in that nothing in this score indicates an overall level of an employee's excellence. Only the *relative* strengths of the items on the list of characteristics is displayed in the metric, and individual differences arise solely from variance in degree of match between the two rankings. This study is an attempt to investigate the utility of ipsative rankings as a criterion metric when used alone and in combination with the more typical normative ratings.

Every worker in criterion research is well aware of the conceptual and methodological problems involved. Criterion measures are difficult to devise, but a design which can demonstrate the adequacy of a criterion metric is even more difficult to conceive. One approach is to find a situation with an acceptable

[1] For a more complete description of the ipsative vs. normative concept, see Cattell (1944, 1957).

ultimate criterion against which one can validate the criterion metric under consideration. "Validating" a criterion makes practical sense only in certain situations, such as (a) one which involves an attempt to replace a very expensive measurement with one which is less expensive, or (b) one in which an ultimate criterion may be collected only once, for the purpose of attempting to evaluate the extent that another routinely collectible criterion will serve as a good substitute, or (c) a situation such as this, where the particular criterion is of interest only in studying a *method* of collecting data which might be transferable to other situations where a more ultimate criterion might not be readily available. This study, although it occurs in a specific training situation, is a study of method.

II. METHODOLOGY

The subjects of this study were trainees in each of three Air Force technical schools.

a. Security Specialist (L3ABR81130) N = 112, School A.

b. Ground Radio Equipment Repairman (E3ABR30434) N = 68, School B.

c. Jet Engine Mechanic (3ABR42632) N = 94, School C.

Those three schools were selected primarily because they still provide final school grades upon graduation of the students. School grades provided an essential external criterion. Each student was required first to provide a normative rating for each of his peers on a 10-point scale from 1 ("Inferior") to 10 ("Superior") based on how well they were "doing in this course." The same normative rating was also collected from each instructor on each of his students.

Additionally, each student was required to provide a rank ordering of a list of characteristics (see Appendix A) for each of his peers. He was to consider one peer at a time and select which trait was strongest in the peer, which was second strongest, and so on through the list of 10 characteristics. Then the student was required to rank the same 10 characteristics "to show how important they are to the successful completion of this course."

The instructor of each group was also required to rank the characteristics for each student and for the course. The instructor's supervisor provided a ranking of the characteristics for the course.

It is believed that the selection of a particular set of traits is not crucial in this context, so long as some of the traits seem relevant to job performance. The rater is required only to rank each trait relative to the other traits, as they appear in the ratee, and as they are required by a particular job. If some are not highly job relevant, they should tend to be placed at the lower end of the rank order for that job—although for some other job they may be near the top.

It was intended that data be collected from 10-member rating groups with 306 cases. Because of various problems with missing data, the N of 306 dropped to 176 matched students with complete information, and it was with this sample that the first analyses were made. Distributions indicated that 109 instructors had failed to evaluate their students, either normatively or ipsatively, and that 98 of these cases could be saved if the instructor rating variables were dropped. This was done, and the later analyses were made on 274 cases.

At this point, there were opportunities to calculate nine rank-order correlations (rho) for each subject:

1. Course ranking by students vs. student ranking by students.
2. Course ranking by students vs. student ranking by instructor.
3. Course ranking by students vs. student self-ranking.
4. Course ranking by instructor vs. student ranking by students.
5. Course ranking by instructor vs. student ranking by instructor.
6. Course ranking by instructor vs. student self-ranking.

7. Course ranking by supervisor vs. student ranking by students.

8. Course ranking by supervisor vs. student ranking by instructor.

9. Course ranking by supervisor vs. student self-ranking.

These values were computed to provide evidence concerning the relative quality of rankings from different sources. The school setting in which this study was performed contained desirable analogs to on-the-job environments—the instructor was analogous to a first-line supervisor, the instructor's supervisor was analogous to a work-situation second-line supervisor, and the school grades were analogous to a "real" on-the-job criterion that is rarely available in the real world. Since we know that operational normative ratings are influenced to some degree by a supervisor's tendency to over-rate his workers, it might be better in the projected use of a worker-job match index to have the qualities ranked for the job by someone other than whoever ranks the qualities in the workers. This refinement would make it considerably more difficult for the supervisor—or anyone else—to manipulate the evaluation system.

Ultimately, there are two crucial questions about the job-worker match coefficient.

1. When final school grades are predicted by normative ratings, does the addition of the job-worker match coefficient increase prediction when it is added to the prediction system? This is another way of asking whether the job-worker coefficient contains unique valid variance. If so, the indication would be that both normative and ipsative rating data should be collected for use as a rating criterion. If not, the next question becomes important.

2. When final school grades are predicted by job-worker match coefficients, does it improve prediction to add normative ratings to the system? This question is important because of the possibility that neither a normative nor an ipsative rating adds unique valid variance to the other, but each predicts the criterion. It is conceivable that both kinds of ratings measure essentially the same thing. If this should be the case, data such as the job-worker match coefficient would have a substantial practical advantage over ordinary normative ratings because they cannot be so easily manipulated. If the job-worker coefficient does not add unique valid variance, and if normative ratings do add such variance, then it may safely be said that the job-worker match data collected in this instance were not of value.

III. RESULTS AND DISCUSSION

Nine rank-order correlations were computed for each student, forming nine new variables. Correlations among these nine variables, the global rating from the instructor, the global peer ratings averaged across groups, each subject's self rating, and school grades are shown for each school in Tables 1, 2, and 3. There were severe problems with the data, so that when all cases with complete records were assembled, N's had shrunk to 84, 33, and 59 for the three schools. Nevertheless, there were some obvious trends in the matrices.

1. Clearly the highest validities against final school grades among the three normative ratings (by instructors, by self, and peer average) occurred for peer ratings in each of the three schools. Average correlations with final school grade across the three schools were .19 for instructor ratings, .20 for self ratings, and .45 for average peer ratings (Table 4). This result argues for the superiority of peer ratings among sources of normative rating data, despite the fact that, among the three sources, peer ratings uniformly had much the smallest standard deviations in all three schools.

2. Inspecting the sub-matrix which displays the intercorrelations among the job-worker coefficients, one is struck by the size of the correlations between those arising from the same source of student evaluation, regardless of the genesis of the job evaluation component. For example, in Table 1, CP-SS (course rankings by peers; student ranking by students) correlates .70 with CI-SS (course ranking by instructor; student ranking by students). The only other large CP-SS correlation is .63 with CS-SS (course by supervisor; student by students). If we may call the first two letters of each job-worker coefficient a

Table 1. **Final School Grade, Ratings, and Job-Worker Coefficients, Course L3ABR 81130, Security Specialist**
(N = 84)

		Normative Ratings			Job-Worker Coefficients[a]										
	FSG	Inst Rtgs	Self Rtgs	Peer Rtgs	CP-SS	CP-SI	CP-SR	CI-SS	CI-SI	CI-SR	CS-SS	CS-SI	CS-SR	Mean	SD
Final School Grade	1.00[b]	.26	.22	.45	.17	.05	.18	.18	.02	.18	.20	.00	.23	87.7	5.14
Instructor Ratings	.26	1.00	.16	.17	.11	.19	.06	.15	.23	−.08	.13	.19	.15	6.36	1.79
Self Ratings	.22	.16	1.00	.43	.30	.17	.18	.32	.04	.09	.36	.03	.34	7.33	1.38
Peer Ratings	.45	.17	.43	1.00	.40	.09	.11	.33	−.03	.05	.44	.20	.22	6.48	.86
Job-Worker Coefficients[a]															
CP-SS	.17	.11	.30	.40	1.00	.18	.09	.70	.00	.06	.63	.01	.11	.35	.33
CP-SI	.05	.19	.17	.09	.18	1.00	−.16	.26	.77	−.10	.24	.67	.17	−.01	.36
CP-SR	.18	.06	.18	.11	.09	−.16	1.00	.11	−.19	.79	.00	−.15	.64	.20	.41
CI-SS	.18	.15	.32	.33	.70	.26	.11	1.00	.15	.03	.46	.10	.18	.41	.33
CI-SI	.02	.23	.04	−.03	.00	.77	−.19	.15	1.00	−.12	.15	.54	.11	.15	.38
CI-SR	.18	−.08	.09	.05	.06	−.10	.79	.03	−.12	1.00	−.01	−.12	.49	.24	.39
CS-SS	.20	.13	.36	.44	.63	.24	.00	.46	.15	−.01	1.00	.14	.09	.17	.31
CS-SI	.00	.19	.03	.20	.01	.67	−.15	.10	.54	−.12	.14	1.00	.05	.05	.31
CS-SR	.23	.15	.34	.22	.11	.17	.64	.18	.11	.49	.09	.05	1.00	.17	.35

[a]CP = Course ranked by peers; CS = Course ranked by supervisors; CI = Course ranked by instructors; SS = Students ranked by students; SI = Students ranked by instructors; SR = Self-ranking.

[b].05 level = .21; .01 level = .28.

Table 2. **Final School Grade, Ratings, and Job-Worker Coefficients, Course E3ABR30434, Ground Radio Equipment Repairman**
(N = 33)

		Normative Ratings			Job-Worker Coefficients[a]										
	FSG	Inst Rtgs	Self Rtgs	Peer Rtgs	CP-SS	CP-SI	CP-SR	CI-SS	CI-SI	CI-SR	CS-SS	CS-SI	CS-SR	Mean	SD
Final School Grade	1.00[b]	.38	.39	.62	.24	−.09	.15	.46	.17	.20	.25	.01	.18	88.0	4.30
Instructor Ratings	.38	1.00	.08	.39	.14	.02	.33	.19	.32	.29	.01	.25	.32	7.70	1.34
Self Ratings	.39	.08	1.00	.44	.35	−.08	.10	.50	−.11	.29	.29	−.10	−.04	7.06	1.28
Peer Ratings	.62	.39	.44	1.00	.45	−.09	.22	.68	.18	.32	.30	−.07	.21	6.56	.97
Job-Worker Coefficients[a]															
CP-SS	.24	.14	.35	.45	1.00	−.17	−.14	.73	−.16	−.19	.63	−.27	−.15	.56	.30
CP-SI	−.09	.02	−.08	−.09	−.17	1.00	.03	−.33	.65	.18	−.44	.54	.04	.21	.30
CP-SR	.15	.33	.10	.22	−.14	.03	1.00	−.09	.18	.62	−.07	.24	.76	.47	.34
CI-SS	.46	.19	.50	.68	.73	−.33	−.09	1.00	−.23	−.05	.68	−.38	−.10	.45	.30
CI-SI	.17	.32	−.11	.18	−.16	.65	.18	−.23	1.00	.31	−.38	.69	.34	.18	.29
CI-SR	.20	.29	.29	.32	−.19	.18	.62	−.05	.31	1.00	−.12	.26	.72	.24	.33
CS-SS	.25	.01	.29	.30	.63	−.44	−.07	.68	−.38	−.12	1.00	−.34	−.03	.40	.25
CS-SI	.01	.25	−.10	−.07	−.27	.54	.24	−.38	.69	.26	−.34	1.00	.27	.17	.26
CS-SR	.18	.32	−.04	.21	−.15	.04	.76	−.10	.34	.72	−.03	.27	1.00	.25	.29

[a]CP = Course ranked by peers; CS = Course ranked by supervisors; CI = Course ranked by instructors; SS = Students ranked by student; SI = Students ranked by instructors; SR = Self-ranking.

[b].05 level = .34; .01 level = .41.

Table 3. **Final School Grade, Ratings, and Job-Worker Coefficients, Course 3ABR42632, Jet Engine Mechanic**
(N = 59)

		Normative Ratings			Job-Worker Coefficients[a]										
	FSG	Inst Rtgs	Self Rtgs	Peer Rtgs	CP-SS	CP-SI	CP-SR	CI-SS	CI-SI	CI-SR	CS-SS	CS-SI	CS-SR	Mean	SD
Final School Grade	1.00[b]	−.09	−.02	.22	.07	.31	.24	.09	.36	.16	.05	−.04	−.13	90.3	12.8
Instructor Ratings	−.09	1.00	.19	.47	.25	−.01	−.05	.33	.03	−.05	.17	−.17	.14	6.46	2.07
Self Ratings	−.02	.19	1.00	.30	.25	.15	.05	.32	.09	−.01	−.09	.14	.15	7.76	1.61
Peer Ratings	.22	.47	.30	1.00	.55	.08	.12	.59	.11	.04	.09	.05	.13	7.34	1.51
Job-Worker Coefficients[a]															
CP-SS	.07	.24	.25	.55	1.00	.36	.28	.93	.23	.21	−.06	.35	−.12	.45	.39
CP-SI	.31	−.01	.15	.08	.36	1.00	.26	.32	.88	.14	.01	.22	−.06	.26	.34
CP-SR	.24	−.05	.05	.12	.28	.26	1.00	.33	.19	.90	−.12	−.02	−.25	.38	.34
CI-SS	.09	.33	.32	.59	.93	.32	.33	1.00	.18	.25	−.20	.32	−.12	.47	.38
CI-SI	.36	.03	.09	.11	.23	.88	.19	.18	1.00	.06	.20	−.13	−.06	.33	.33
CI-SR	.16	−.05	−.01	.04	.21	.14	.90	.25	.06	1.00	−.15	.00	−.45	.41	.37
CS-SS	.05	.17	−.09	.09	−.06	.01	−.12	−.20	.20	−.15	1.00	−.34	.22	.00	.26
CS-SI	−.04	−.17	.14	.05	.35	.22	−.02	.32	−.13	.00	−.34	1.00	−.07	−.02	.29
CS-SR	−.13	.14	.15	.13	−.12	−.06	−.25	−.12	−.06	−.45	.22	−.07	1.00	−.03	.28

[a]CP = Course ranked by peers; CS = Course ranked by supervisors; CI = Course ranked by instructors; SS = Students ranked by students; SI = Students ranked by instructors; SR = Self-ranking.

[b].05 level −.26; .01 level = .33.

Table 4. **Validities of Normative Ratings Against Final School Ratings**
(N = 176)

School	Normative Rating Scores		
	Instructor	Self	Peer
1	.26	.22	.45
2	.38	.39	.62
3	−.09	−.02	.22
Average[a]	.19	.20	.45

[a]Converted to Fisher z's, averaged, and reconverted to r's.

"prefix" and the last two letters a "suffix," it is obvious that a strong determiner of the size of the relationship is similarity of suffix. The high correlations in this sub-matrix are the two already mentioned and CP-SI versus CI-SI (.77); CP-SI versus CS-SI (.67); CP-SR (course by students; student self-ranking) versus CI-SR (.79); CP-SR versus CS-SR (.64); CI-SS versus CS-SS (.46); CI-SI versus CS-SI (.54); and CI-SR versus CS-SR (.49). The interesting point of these correlations is that every one of them is between coefficients with the same suffix. Similarity of prefix seems to have little or no effect on the size of the correlation. What this seems to be saying is that the ipsative ranking of the subjects is different from different sources (that is, whether the rankings are obtained from self, from peers, or from the instructor), but the ranking of the qualities in the job (that is, school performance) must be rather similar across the three sources (the supervisor, the instructor, and the students).

This pattern of high correlations among similar suffixes continues with remarkable regularity through all three tables, except for one exception in Table 3. The exception is that the set of course-by-supervisor job-worker coefficients does not provide high intercorrelations with any variable at this school. It appears that these course rankings were not very good in any respect—notice that these three coefficients correlated very poorly with final school grade and that the means of these numbers were uniformly very close to zero.

When validities for final school grades yielded by similar prefixes are averaged across suffix and across schools, the following results are obtained: CP-XX = .15; CI-XX = .21; and CS-XX = .08 (Table 5). This indicates that, across all subjects, the best estimates of qualities in the job are provided by the instructors and the least valid by the supervisors. When validities are averaged across suffixes and schools, XX-SS = .20, XX-SI = .09, and XX-SR = .15. The interpretation is that peers give the best ipsative rankings of qualities in the subjects and the instructors provide the least valid. Combining these two findings, it seems reasonable to expect the highest final school grade validities among the job-worker coefficients to occur with that particular blend of rankings of qualities in the job by instructors and ranking of qualities in the students by their peers (CI-SS). This combination provides the highest validities of the job-worker coefficients averaged across the three schools (.25).

The regression problems culminating this study posed a problem. There were many missing cases of instructors rating students. Since regression problems require rather large N values to produce stable results, the largest possible N was desired. It was decided to perform the regressions on problems involving instructor-provided student rankings first on the smaller N (176) and perform the other regressions afterward on the larger N (274). The intercorrelation matrix recomputed on the larger N is not given here since there were no major changes in the pattern of intercorrelations. Table 6 contains the information from the regressions performed on the instructor variables, school by school, and Table 7 contains similar results from those variables not involving ratings of students provided by instructors.

Table 6 indicates that, in two of the three schools, normative instructor ratings predict final school grades as well as a set of predictors composed of normative instructor ratings plus job-worker coefficients derived from student rankings provided by instructors. In the third school, just the reverse is true—the job-worker coefficients provide all the predictive power available from a set of job-worker coefficients plus

Table 5. **Validities of Job-Worker Coefficients Against Final School Grade**
(N = 176)

School	Job-Worker Coefficients[a]														
	CP-SS	CP-SI	CP-SR	CI-SS	CI-SI	CI-SR	CS-SS	CS-SI	CS-SR	CP-XX	CI-XX	CS-XX	XX-SS	XX-SI	XX-SR
1	.17	.05	.18	.18	.02	.18	.20	.00	.23						
2	.24	−.09	.15	.46	.17	.20	.25	.01	.18						
3	.07	.31	.24	.09	.36	.16	.05	−.04	−.13						
Average[b]	.16	.09	.19	.25	.19	.28	.17	−.01	.09						
Prefix Averages										.15	.21	.08			
Suffix Averages													.20	.09	.15

[a]CP = Course ranked by peers; CS = Course ranked by supervisors; CI = Course ranked by instructors; SS = Students ranked by students; SI = Students ranked by instructors; SR = Self-ranking.

[b]Converted to Fisher z's, averaged, and reconverted to r's.

Table 6. **Regression Problems Against Final School Grades, Involving Instructor Rankings of Students**
(N = 176)

Model[a]	R^2 Full	R^2 Restr
School A (N = 84)		
Instr Rtg + CP-SI	.07	
Instr Rtg alone		.07
CP-SI alone		.00[b]
Instr Rtg + CI-SI	.07	
Instr Rtg alone		.07
CI-SI alone		.00[b]
Instr Rtg + CS-SI	.07	
Instr Rtg alone		.07
CS-SI alone		.00[b]
School B (N = 33)		
Instr Rtg + CP-SI	.15	
Instr Rtg alone		.15
CP-SI alone		.01[b]
Instr Rtg + CI-SI	.15	
Instr Rtg alone		.15
CI-SI alone		.03
Instr Rtg + CS-SI	.15	
Instr Rtg alone		.15
CS-SI alone		.00[b]
School C (N = 59)		
Instr Rtg + CP-SI	.10	
Instr Rtg alone		.01[b]
CP-SI alone		.10
Instr Rtg + CI-SI	.14	
Instr Rtg alone		.01[c]
CI-SI alone		.13
Instr Rtg + CS-SI	(d)	

[a] CP = Course by peers; CI = Course by instructor; CS = Course by supervisor; SI = Students by instructor.

[b] Significantly different from full model R^2 beyond .05 level.

[c] Significantly different from full model R^2 beyond .01 level.

[d] No component of full model significantly different from zero.

Table 7. **Regression Problems Against Final School Grades Not Involving Instructor Rankings of Students**
(N = 274)

Model[a]	R^2 Full	R^2 Restr
School A (N = 112)		
Peer Rtg + CP-SS	.10	
Peer Rtg		.09
CP-SS		.03[b]
Peer Rtg + CP-SR	.10	
Peer Rtg		.09
CP-SR		.02[b]
Peer Rtg + CI-SS	.11	
Peer Rtg		.09
CI-SS		.05[b]
Peer Rtg + CI-SR	.11	
Peer Rtg		.09
CI-SR		.03[b]
Peer Rtg + CS-SS	.10	
Peer Rtg		.09
CS-SS		.05[b]
Peer Rtg + CS-SR	.12	
Peer Rtg		.09
CS-SR		.04[b]
School B (N = 68)		
Peer Rtg + CP-SS	.50	
Peer Rtg		.50
CP-SS		.10[b]
Peer Rtg + CP-SR	.50	
Peer Rtg		.50
CP-SR		.04[b]
Peer Rtg + CI-SS	.52	
Peer Rtg		.50
CI-SS		.23[b]
Peer Rtg + CI-SR	.50	
Peer Rtg		.50
CI-SR		.03[b]
Peer Rtg + CS-SS	.52	
Peer Rtg		.50
CS-SS		.07[b]
Peer Rtg + CS-SR	.50	
Peer Rtg		.50
CS-SR		.02[b]
School C (N = 94)		
Peer Rtg + CP-SS	.01	
Peer Rtg		.01
CP-SS		.01
Peer Rtg + CP-SR	.02	
Peer Rtg		.01
CP-SR		.01
Peer Rtg + CI-SS	.01	
Peer Rtg		.01
CI-SS		.00
Peer Rtg + CI-SR	.01	
Peer Rtg		.01
CI-SR		.01
Peer Rtg + CS-SS	.01	
Peer Rtg		.01
CS-SS		.00
Peer Rtg + CS-SR	.02	
Peer Rtg		.01
CS-SR		.01

[a]CP = Course by peers; CI = Course by instructors; CS = Course by supervisor; SS = Student by Students; SR = Student self-rating.

[b]Significantly different from full model R^2 beyond .01 level.

instructor ratings. This finding leaves us in an ambiguous state, particularly when we consider that normative instructor ratings are not analogous to operational supervisor ratings in one important respect. There was no pressure on these instructors to distort their ratings as there is on supervisors. Probably these instructor ratings are considerably more accurate than those taken from supervisors in an operational situation.

Table 7 presents results that are much less equivocal than those in Table 6. In schools A and B, the contribution of the normative peer rating to the ipsative peer rankings is significant beyond the .01 level. The contribution of the ipsative peer rankings, on the other hand, is not significant when used with normative peer ratings and is sometimes not significant when used alone. In school C, neither peer ratings nor the job-worker indexes are significantly correlated with final school grades.

IV. SUMMARY AND CONCLUSIONS

As is so often the case with the first study of a series investigating the efficacy of an idea, the results of this study did not firmly establish the superiority of either ipsative or normative rankings. In some combinations, some job-worker match coefficients predicted final school grades better than did normative ratings, either alone or in combination. In most combinations, the reverse was true, but there seems to be enough promise in the technique to warrant further investigation.

In this particular situation, it appears that the job-worker coefficient issuing from job-ranking by instructors and student ranking by their peers produced the best prediction of final school grades. Special attention should be given to this metric in future work.

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APPENDIX A: STUDENT CHARACTERISTICS RANKING SHEET

Below is a list of 10 personal characteristics with their definitions. Take time now to read the definitions.

1.	**Carefulness**	Taking the necessary time and effort to produce work which has few errors.
2.	**Responsiveness**	Responding very quickly to the demands of the course, often completing work sooner than required.
3.	**Initiative**	Working well alone with very little guidance, looking ahead to future course requirements, and doing what should be done without being directed to do so.
4.	**Creativity**	Using unusual and clever ideas to come up with original solutions to problems.
5.	**Tolerance of Stress**	Working well under pressure; one's ability to perform isn't hurt by tension.
6.	**Cooperation**	Working well with others to perform tasks and solve problems.
7.	**Adaptability**	One can easily change what he does to fit the needs of the course.
8.	**Writing Ability**	Writing clearly so that people can understand.
9.	**Speaking Ability**	Speaking clearly so that people can understand.
10.	**Reasoning Ability**	Understanding the most important ideas taught in the course, and using these ideas to perform tasks and solve problems.

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